PATENT SPECIFICATION

387,875

Convention Date (France): April 11, 1931.

Application Date (in United Kingdom): April 14, 1932. No. 10,724/32.

Complete Accepted: Feb. 16, 1933.

COMPLETE SPECIFICATION.

ERRATUM

SPECIFICATION No. 387,875

In the heading on page 1, *for* "April 11, 1931" *read* "June 11, 1931"

THE PATENT OFFICE,

9th May, 1933.

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respect to the earth. This method does not provide satisfactory results because it is practically impossible to obtain in wet weather sufficient insulation to avoid disagreeable sensations to the passengers and because accidental contact may have grave consequences.

The second method consists in earthing one of the line wires, in general the negative wire, and in electrically connecting to the chassis the pole of the corresponding equipment. This contact of the negative on the chassis may be effected either by hand or automatically by a device containing either valves or a polarised relay. This method has the disadvantage of necessitating the earthing throughout its length of the negative conductor which without sensibly reducing the electric resistance of the circuit produces in the earth stray currents, which are very dangerous from numerous points of view.

The new method which forms the subject of the present invention avoids these

[*Price* 1/-]

of distribution of electrical energy.

For example the line may be supplied by two or more generators or synchronous converters in series with an earth connection at the mid point of the whole.

The line may be supplied by a generator or synchronous converter with a voltage distributor (formed for example by a resistance or a reactance or two balancing machines in series) of which the mid point is earthed.

The line may be supplied by a synchronous converter with a neutral point, alternative side, connected to earth.

To bring the mass of the chassis to a mean potential between those of the two poles of the line also any suitable means whatever may be employed. For example on the vehicle a resistance or system of resistances may be branched between the two poles of the equipment and the mass of the chassis connected to the centre of this resistance or system of resistances. The value of these balancing resistances should be very small in rela-

tion to the values of the insulating resistance but however sufficient so as not to cause useless waste of energy.

The annexed drawing shows by way of example, to which the invention is not limited, one embodiment of the invention. The particular arrangements which will be described with respect to this example should be considered as forming part of the invention, it being understood that any equivalent arrangement could also be utilised without departure from the invention.

It has been assumed for the purpose of explanation that the invention is applied to a trolley bus. The current is collected on the supply line by means of two poles by two contacts 1 and 2 and passes to the terminals of a bi-polar switch 3, the closing coil 4 of which is supplied by the voltage of the line. As soon as there is current in the line this switch closes and permits the starting of the vehicle by means of the controller 5; the direct current driving motor is indicated by 6.

In accordance with the invention the contacts are supplied by two lines brought to equal voltages and of opposite sign with respect to the earth. Moreover, on the vehicle between the two poles of the equipment are branched four identical resistances 7, 8, 9, 10 arranged in pairs in series. A relay 11 has its coil 12 branched to the common ends of the resistances 7, 8, and 9, 10. One of the ends of the coil 12 is moreover connected to the mass 13 of the chassis of the vehicle.

It will be seen

1) That the voltage at 13 is equal to the algebraic mean of the voltages of the two line wires, thus equal to that of the earth, these two voltages being equal and of opposite sign.

2) That the coil 12 of the safety relay 11 is traversed by current in the following accidental circumstances:

(*a*) Breakage of one of the resistances 7, 8, 9, 10.

(*b*) Earthing at any point whatever (for example at 14) of the circuits of the vehicle.

3) That the switch 3 falls and interrupt the current at the two poles (for current fails at one of the poles (for example due to disengagement of one of the contacts).

When operating, the relay 11 may either actuate an audible or luminous signal 15 supplied by an auxiliary source of current 16 (as in the figure) or cause the switch 3 to open and thus interrupt the current to the vehicle as soon as there is produced a connection to the chassis of the vehicle of a sufficiently low ohmic value or interruption of the balancing resistances; for example, the movable member of the relay 11 may normally close a switch formed in the circuit 4, this switch being opened when the coil 12 is sufficiently excited; in the latter case it will be convenient to utilise as the safety relay 11 a relay having a mechanical or magnetic locking arrangement, so that once the relay has operated manual operation will be necessary to reset it in normal position.

The safety device may moreover be completed by placing in the connection of the mass 13 a low resistance galvanometer. With good insulation it will not move, but with bad insulation it will move and the direction of deviation will indicate to the driver on which pole the insulation is poorer.

In addition to its effectiveness in the case considered the method forming the subject of the invention presents the following advantages:

1) For the same difference of potential between the two poles of the supply line and consequently for the same loss in line, the differences in potential between the earth and the conductors are half, so that greater ease in insulation and reduction of the dangers of electrocution by contact with the line are obtained.

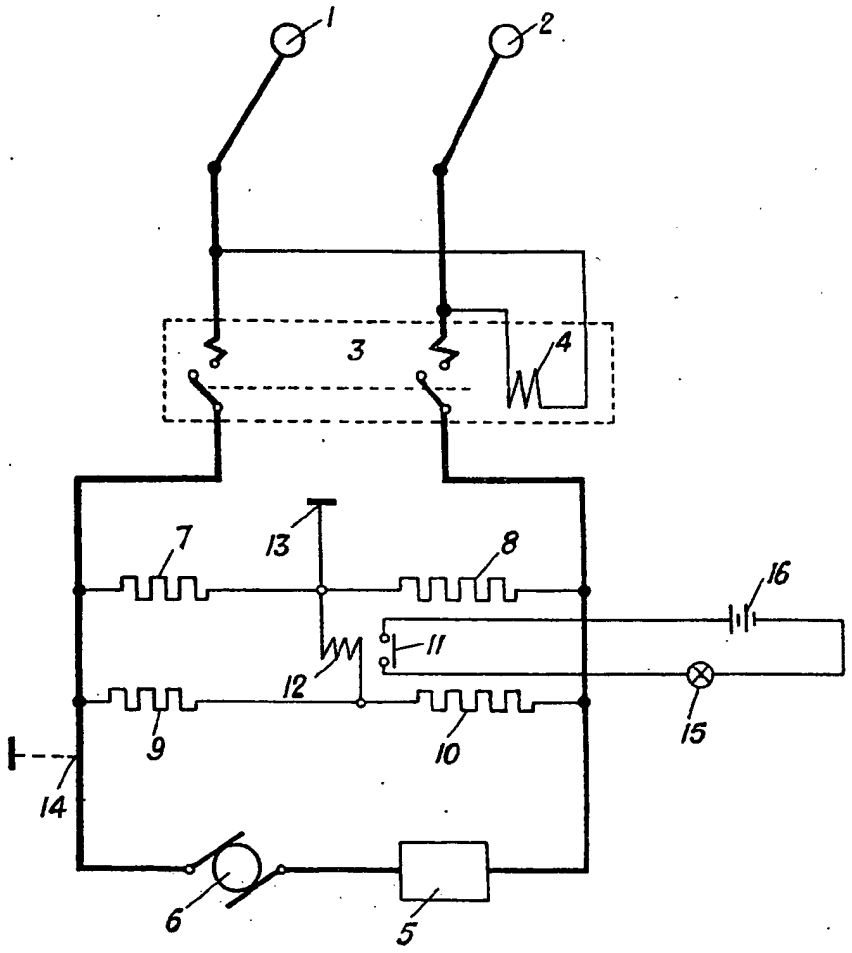
2) The circuits remain entirely independent of the earth and the dangerous effects of stray currents need not be feared.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Means for ensuring safety in use of trackless electric road vehicles such as trolley buses supplied by overhead conductors characterised by the supply of the two wires of the line providing the energy for the vehicles at equal potentials and of opposite sign with respect to the earth, the mass of the chassis of the vehicle being brought to a mean potential between those of the two wires of the supply line.

2. Means as claimed in claim 1 characterised in this that the mass of the chassis of the vehicle is connected to the mid point of a resistance or system of resistances branched between the two wires of the supply line.

3. Means as claimed in claims 1 and 2 characterised in this that the current which circulates in accidental circumstances in the connection bringing the chassis to a mean potential between those of the two wires of the line is utilised



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